

DRAFT REPORT

For

INSTITUTO NACIONAL FORESTAL

OPERATIONAL PROJECT FOR CONTROL OF THE SOUTHERN PINE BEETLE,
(DENDROCTONUS FRONTALIS ZIMMERMAN) IN THE PINE FORESTS OF
NICARAGUA-OBSERVATIONS AND RECOMMENDATIONS

By

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FOREIGN AGRICULTURAL SERVICE (USDA/FAS)

OPERATIONAL PROJECT FOR CONTROL OF THE SOUTHERN PINE BEETLE,
DENDROCTONUS FRONTALIS ZIMM., IN THE PINE FORESTS NEAR JALAPA,
NICARAGUA-OBSERVATIONS AND RECOMMENDATIONS

1.0 INTRODUCTION

Southern pine beetle, Dendroctonus frontalis Zimm, is the most destructive insect pest of pine in the southern United States and Central America. This beetle is currently in outbreak status in Nicaragua and several other Central American countries. The outbreak in Nicaragua began in 1999 near the Honduras border northeast of Ocotal near Jalapa (Figure 1). Initially an infestation covering 30 hectares was detected in Teotecacinte, a municipality of Jalapa, Nicaragua. Due to a lack of resources and no clear direction or plan to follow, little was done to reduce the impact of the beetle and the outbreak continued to increase during the next year.

1.2. Action Plan for Controlling the Southern Pine Beetle

Dr. Ron Billings of the Texas Forest Service was appointed by USAID to evaluate the problem and develop a plan of action for the Nicaraguan government to reduce damage caused by the southern pine beetle (Appendix 1). The action plan called for the use of the “cut and leave” method frequently used in the Southern United States. This method is based on interrupting the attacking behavior of the beetles. Beetles produce a sex attractant when they are attacking green trees. This attractant brings thousands of beetles to the area that continue to attack and enlarge the infestation. If the green freshly attacked trees are cut they are no longer able to attract beetles and the infestation stops growing. The action plan also establishes a 6km.x 200meter containment buffer strip designed to slow the southward movement of the infestation. In the buffer all recently attacked trees (green crowns) and a strip of adjacent unattacked trees are to be cut.

The development of a long-term control strategy is also recommended. Maintaining a healthy and vigorous growing pine forest is the best way to protect the pine resource.

1.3 Forest Resources in Nicaragua

Nicaragua has a forest area of 5,454,000 hectares, consisting of 3,028,673 hectares of broadleaved forests, 630,000 hectares of buffer forests, 1,100,000 hectares of protected areas, 155,000 hectares of mangroves and 40,000 hectares of plantations and 500,327 hectares of pine forests. Only 37,575 hectares of the pine forests are under management. Most of the pine forests belong to private landowners (Billings, 2001). The pine forests are important as a source of timber in addition to serving as areas of soil and watershed conservation. The forests are also used for grazing cattle, firewood gathering, fence posts, wildlife and many other uses.

1.4 Technical Information (Southern Pine Beetle)

The southern pine beetle is a native insect capable of destroying the pine resource during outbreak periods. Low-level populations are usually present throughout its range and periodically reach epidemic levels. Outbreaks can last from 1 to 5 years. Little is known about what triggers the outbreaks or what actually causes them to collapse. Research has shown, however, that poor forest management practices or no management can contribute to the severity of the outbreak. Forest stands at greatest risk are mature to overmature, high basal areas.

Overstocked and over mature forest stands provide suitable conditions for infestations. As long as these conditions are present the beetle outbreak will continue until natural factors cause the populations to collapse.



FIGURE 1 - Location of Southern Pine Beetle Control Project – Jalapa, Nicaragua

1.5 Mission Objectives (Scope of Work)

The objective of this mission was to provide technical assistance to the Nicaraguan government to implement the action plan for controlling the southern pine beetle in the Jalapa area of Nicaragua (Appendix A). The scope of work provided by USAID was as follows:

- Establish a containing buffer strip to stop the advancement of the infestation of Maoarali to the south. The buffer strip needs to measure about 6 km in length by 200 m in width (1200 hectares) connecting the broadleaf forests close to Los Terrerios to the east, with an area on the west of the infestation of forests already killed by the beetle.
- This preventive strip will be composed of all the trees that have just been attacked (the ones in first stage-producers of attractants plus a buffer of green non-attacked trees adjacent to the green freshly attacked trees) felled along the active front.
- Hire 50 chainsaw workers (5 brigades), each with their own equipment, and 10 forestry technicians of the private sector to supervise.
- The coordinator of the project will be the forestry engineer of the Instituto Nacional Forestal (INAFOR)
- located in Jalapa. Forestry technicians of INAFOR qualified in the direct control of the outbreak of pine beetle will be in charge of marking the active front and conducting follow-on of the projects in the field
- Upon completion of the main containing buffer strip, control brigades and forestry technicians will be dedicated to the control and clearing of other isolated outbreaks in Nueva Segovia until all of the active outbreaks are controlled.

1.6 Length of Mission

The consultant and survey specialist, Mr. Walter Salazar, also with the USDA Forest Service, arrived in Nicaragua for a six-week period beginning May 7, 2001 to June 14, 2001.

2.0 ACTIVITIES CONDUCTED DURING THE MISSION

- Reviewed work plan with Dr. Billings and INAFOR staff at Jalapa.
- Held briefing on status of work in the field with Dr. Billings.
- Conducted field demonstrations for the tree cutters on the safe use of chainsaws.

- Provided training on the cut and leave method and explained the biological basis for using this method of direct control.
- Distributed safety and work equipment to the tree cutters, technicians and the municipal biologist.
- Conducted daily visits to field to monitor the implementation of the work plan.
- Monitored the field crews to assure adherence to the work plan.
- Provided transportation for cutters to the work area when necessary.
- Met with staff and crew each morning to identify any problems, potential problems or suggestions to improve the efficiency of the control project.
- Assisted technicians daily in locating breakouts and new spots.
- Organized weekly coordination meetings with staff and World Relief to discuss the progress of the project and to identify any problems encountered.
- Worked with Mayor of Jalapa and his staff periodically to keep them informed of progress and to plan future work.
- Assisted the municipal biologist in preparing an information brochure for the public on the control of the southern pine beetle.
- Collected infested logs for rearing out bark beetles, parasites and predators and associated insects.
- Met frequently with local landowners in the project area to explain the control project, defuse potential problems and create good will.
- Visited local sawmills to discuss processing of beetle killed trees and growing concern about markets for the southern pine beetle killed trees.
- Conducted an aerial survey via helicopter to locate breakouts and new spot infestations.
- Aerial survey specialist, Mr. Walter Salazar, provided aerial survey training for forestry technicians.
- Mr. Carlos Rodriguez provided GPS and computerized mapping training for forest technicians.
- Prepared and distributed a flyer soliciting tree cutters for the project.
- Evaluated the southern pine beetle outbreak near Esteli with INAFOR and CARE.

- Contacted Mr. Charles Dull, USDA Forest Service Remote Sensing Coordinator, to assist in getting satellite coverage of the project area for use in evaluating the damage caused by the beetle and follow-up reforestation and erosion control.
- Provided information to press, including a field visit to the affected area, to explain the current situation and the goals of the project.
- Participated in a press briefing at the US Embassy with a reporter from the Miami Herald concerning the control project and the role of the US Government.
- Escorted Dr. Karl Kehr representing the World Bank to view the project area to determine the potential for utilizing the affected timber and rehabilitate the damaged sites.

3.0 OBSERVATIONS AND ACCOMPLISHMENTS

About 4 kilometers of the buffer had been completed prior to the arrival of this consultant. The buffer was completed on May 28 and was extended to over 16 kilometers instead of the planned 6 kilometers to adjust for the rapidly spreading outbreak (Figure 2). Establishment of the buffer allowed INAFOR to concentrate their control efforts and stop the continuous spread of the infestation southward.



Figure 2. Aerial view of buffer strip cut to control southern pine beetle near Jalapa, Nicaragua during June, 2001

In spite of periods of heavy rain and bad roads, the crews were able to cut more than 150,000 trees while cutting the buffer strip and controlling breakouts in the protected area. See Table 1. Area cut for the breakouts and the buffer strip total more than 713 hectares.

Table 1. Summary of Control Activities

Periodo del 02 Mayo al 08 Junio del 2001

Cantidad	Cantidad de miembros	Dias/hombres Laborados	Brotes Tratados	Arboles Tumbados	Volumen tumbados	Area Total Tratada	Metros de Franja realizados	Productores
6	59	1,170	22	150,122	70,840	713.01	13,527	22

The buffer strip appeared to disperse the beetles rather than allowing a southward movement of continuous infestation. Breakouts and new spots were discovered during the first week of the consultant's arrival. The cutting crews quickly followed-up and treated the breakouts. With the advent of the rainy season, the urgency to complete the buffer required all INOFOR crews to work on the buffer rather than dividing the work between treating breakouts and working on the buffer. Crews with SECOFOR continued to treat breakouts and new spots.

Although there has been a continuous effort to salvage the affected pines, operations were hampered due to rough terrain, lack of modern equipment, poor roads, rain and the requirement to pay a 40% tax to the government on the trees removed (Figure 3 and 4).



Figure 3 Rough, washed-out roads made it difficult to get the beetle-killed pines to markets.



Figure 4. Lack of modern equipment and rough terrain have hampered salvage efforts.

The sawmills in the Jalapa area are running at capacity and thus far have been able to sell all the lumber they are processing. They are processing green trees from the buffer in addition to logs that contain the blue stain fungus introduced by the beetle. The loggers are paid a lower rate for the stained logs because the sawmills also receive less for the stained lumber. There is no reduction in the structural strength of stained lumber compared to non-stained lumber. Although blue stain is present in beetle attacked trees, the absence of wood borers that are commonly found in outbreaks in the United States will allow the cut trees to remain salvageable for a longer period of time (possibly 4 to 6 months). The mill owners are concerned that the market will soon be saturated unless new markets are found. (Figure 5).

There was also local use of the beetle-killed trees for fuelwood and building materials (Figure 6). Temporary houses were built in some areas by using the slabs cut from the salvaged trees.



Figure 5. Lumber cut from salvaged southern pine beetle killed trees at local sawmills



Figure 6. Local people utilized the beetle-killed trees for building materials and fuelwood.

During the aerial survey in mid-June, more than 30 new spots were detected on the protected side of the buffer. INAFOR is setting priorities for treatment based on the criteria outlined in the work plan.

There is a great potential for severe erosion in the project area. Previous burning of the forest floor by farmers to stimulate the growth of grass for cattle has removed most of the undergrowth and litter from the forest floor. In addition, the beetle has killed the overstory that previously reduced the impact of heavy rains. The logging of cut trees on the steep slopes will probably accelerate the problem with erosion unless mitigating measures are taken. (Figure 7).



Figure 7. The absence of trees on steep slopes will be highly susceptible during the rainy season

Southern pine beetle populations in Nicaragua are the highest this consultant has seen in working with this pest for 34 years. Field observations and information recorded from caged logs showed low populations of natural enemies of the beetle including woodborers and other associated insects commonly encountered during outbreaks in the Southern United States.

The project manager, the staff and the cutting crews should be commended for their efficiency and skill in executing the action plan for reducing damage from the southern pine beetle. Their training, experience and dedication resulted in the protection of many high value pine stands and one of the most efficient southern pine beetle control projects the consultant has ever observed.

4.0 DISCUSSIONS AND CONCLUSIONS

The southern pine beetle outbreak in Nicaragua has killed more than two million pine trees since the outbreak began in 1999 (Figure 8). The outbreak is continuing and is expected to spread to other areas. Thus far only about 5 percent of the affected trees have

been cut (about 150,000 trees as of 15 June 2001). INAFOR staff estimates that only 1 percent of the cut trees have been salvaged. Most of the standing dead trees will be lost because they are inaccessible for salvaging and have deteriorated beyond use.



Figure 8. Most of the standing southern pine beetle killed-trees behind the buffer will never be salvaged.

Outbreaks of this pest frequently last from 1 to several years in the southern United States and can decimate the pine resource. If actions are taken when the outbreak is small, it may be possible to control the population. In Nicaragua, because of a lack of resources, a control program was not undertaken until 2001. When assistance became available through USAID populations were so high that control of the southern pine beetle population was unlikely. Under the circumstances the objective of a control project should be to reduce the damage and minimize the spread of the outbreak.

Currently, the outbreak continues to kill trees in the Jalapa area as well as spreading southward and westward to other areas with pine trees. The buffer strip did stop the continuous spread of the beetle southward but did not prevent new spots from occurring on the protected side of the buffer and beyond. The beetle is quite capable of flying a mile or more in search of hosts or in response to a source of aggregating pheromone produced by attacking beetles. However, aggressive efforts by the current project has resulted in the protection of pine stands in the protected area and has greatly assisted in the salvage and utilization of affected trees that would have otherwise been lost.

In the opinion of the consultant, using the cut and leave method will continue to be the best option for control of the beetle in Nicaragua as it has been in the United States along with cut and removal of affected timber through commercial sales. This direct control method is linked to the biology of the beetle since it reduces the source of attractant and

prevents individual infestations from growing larger. Although this method does result in increased mortality to beetle populations during dispersal and by solar radiation, the impact is relatively small compared to the reproduction potential of the overall population.

Continued application of this method in Nicaragua will reduce the damage caused by the southern pine beetle until natural factors bring the outbreak under control. Currently it is difficult to predict when this will occur. Although natural enemies of the beetle have been observed they do not appear to be in sufficient numbers at this time to cause a collapse of the outbreak.

There is some concern that moving infested logs out of the project area will result in the spread of the beetle. This concern may have been valid during the beginning of the outbreak but now the beetle has spread to other areas containing pine trees. It is possible that trees adjacent to a log deck could be attacked, however, it is unlikely that a major problem could result from processing logs outside of the Jalapa area.

The southern pine beetle outbreak in Nicaragua has been severe because of the condition of the pine forests. Overstocked and over mature pine stands, which occur in this area, are extremely susceptible to attack by the southern pine beetle. When infestation occurs there is little to limit continuous spread as revealed on the north side of the buffer strip. It was observed that there were fewer spots and reduced damage in infestations occurring in less dense and younger stands. (Figure 9).



Figure 9. Pine stands with reduced stocking sustained less damage to southern pine beetle than overmature and overstocked stands.

5.0 RECOMMENDATIONS

- The best course of action for the control project is to continue the application of the “cut and leave and cut and salvage” methods to reduce timber losses. These methods will reduce the spread of individual infestations and utilize trees that would otherwise be lost.
- Do not attempt to control the population through the use of chemicals, piling and burning or other direct control methods. Although these methods are used in certain circumstances they would not be beneficial in the project area at this time. These methods would not result in significant population reduction and would be a waste of human and monetary resources in addition to possible damage to the environment.
- Expand or initiate new control activities outside the current project area where resources are available. The beetle has already spread to several new areas south of the project area and prompt control of these spot infestations will drastically reduce heavier losses that will occur without any control efforts.
- Apply priority-setting guidelines when planning control on new spots or breakouts. This is necessary to prevent wasted time and money in controlling infestations that are not a threat to surrounding timber or spots that may go inactive.
- Reforestation may be necessary in many areas where natural regeneration has been destroyed by fires set by farmers and ranchers to stimulate the growth of grass.
- Measures should be taken to reduce erosion mainly in steep areas where control measures have been conducted and all the vegetation and ground litter has been removed by burning.
- Efforts should be made to look for markets for affected timber. This will bring more revenue into the area and provide jobs for local people. This would be preferable to letting the cut trees waste on the ground.
- Consider bringing in several portable sawmills and other logging machinery to increase the capacity for utilizing the affected timber.
- Consider protected storage of logs and processed lumber until markets become available.
- Temporarily eliminate the government taxes on the value of timber sold for the duration of the current emergency. This will result in the harvesting of more affected timber.
- Develop long-term plans to improve the health of the remaining forest to reduce southern pine beetle damage in the future.

- The most important recommendation should be to develop a long-term strategic plan for protecting the pine resource in the country from future outbreaks of the southern pine beetle.

6.0 ACKNOWLEDGEMENTS

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6.0 APPENDIX

APPENDIX A

Action Plan

Immediate Control of the Southern Pine Beetle Outbreak in the Jalapa Area (Department of Nueva Segovia) in Nicaragua

Objective: Control the outbreak of southern pine beetle (*Dendroctonus frontalis*) in the Jalapa area before it extends to other forested areas of the country.

Justification:

- The current bark beetle outbreak, which began in October 1999 with only 30 hectares affected, has now expanded to more than 6,000 hectares.
- Of the total area affected, 85% occurred in the municipality of Jalapa, specifically in an area known as Macarali. In this area, the infestation continues expanding rapidly toward the South, affecting 8 additional hectares per day.
- If this advancing infestation is not halted, the outbreak in Macarali has the potential to infest 10,000 to 20,000 more hectares before the end of the year, extending to other municipalities and forest districts now largely unaffected.
- It is urgent that an aggressive program of control is initiated immediately in Jalapa before the arrival of the rainy season (May or June), because access to the infested area and harvest and utilization of infested trees will be much more difficult during the rainy season.
- An investment of \$120,000 (U.S. dollars) in the next three months to combat this outbreak will pay huge benefits. With a control program initiated immediately, pine forests now threatened by the outbreak, conservatively valued at \$15-\$30 million, will be protected. This estimate is based on a value of \$1,500 U.S. per hectare.
- Prompt control of this outbreak also will serve to protect many watersheds, populations of wildlife and plant communities, and many community residents whose livelihood is dependent on these pine forests.

Methodology:

- A containment buffer will be established to halt the advance of the Macarali infestation toward the South. The buffer will need to extend 6 kilometers long by up to 200 meters wide in order to connect with hardwood forests to the east with an area of dead pines to the west. This 200-meter wide buffer will be installed by felling up to 150 meters of freshly attacked pines (producers of SPB attractants) and the remainder (at least 50 meters) of adjacent uninfested pines along the entire 6 kilometers of active front.
- Fifty chainsaw operators (5 brigades), each one with his own equipment, will be contracted to fell the trees in the buffer. In addition, five forest technicians, each with his own motorcycle, will be hired from the private sector to supervise the chainsaw crews.
- The local coordinator of the project will be the District Forester (Rolando Perez) with the Nicaraguan Forest Service (Instituto Nacional Forestal or INAFOR) located in Jalapa. INAFOR forest technicians trained in southern pine beetle control will be in

charge of marking the boundaries of the containment buffer and monitoring treated areas for breakouts.

- Once the principal containment buffer is installed, the chainsaw crews and forest technical supervisors will direct their attention to the control of smaller infestations in the Department of Nueva Segovia until all active spots are controlled.
- Five or more 4-wheel drive trucks will be requested on loan from other agencies within the Nicaragua Ministry of Agriculture and international organizations for the duration of the control project to transport control crews to the field.
- INAFOR, together with other interested agencies and forest cooperatives, will identify and train forest landowners that hold land within the marked buffer zone. In order to involve these landowners in the control project and lower overall costs, INAFOR should offer them incentives if they fall the trees on their own land within the buffer. One incentive for these participating landowners would be a reduction or elimination of the tax the government charges (\$3.27 per cubic meter) for timber harvests if trees are felled and removed from the buffer zone.
- Any funds left over from the control project should be devoted to public education campaigns for forest landowners on methods of bark beetle prevention